

**Amendments to the Claims:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1-13. (Cancelled)

14. (Currently Amended) A quantum well structure ~~for the absorption or emission of photons~~ comprising quantum well layers (7; 107; 207; 301) stacked in a stacking direction between barrier layers (9, 11; 109, 112; 209, 212; 303), said quantum well layers comprising two subbands having two energy levels, configured such that after emission of a photon from an electron, said electron goes from a high energy level to low energy value in a quantum well layer and such that after absorption of a photon by an electron, said electron originates in a low energy level in a quantum well layer, wherein at least one of ~~[[the]]~~ said barrier layers (9, 11; 109, 112; 209, 212; 303) comprises comprising nanostructures (10; 110; 210; 310) ~~arranged such that said nanostructures cancel or modulate a homogeneity of said quantum well layer extending in at least one lateral direction in the absence of said nanostructures, without substantially influencing energy values in said quantum well layers, wherein the quantum well layer (7; 107; 207; 301) is in the form of an absorption or emission layer for the absorption or emission of the photons, and wherein said at least one lateral direction extends perpendicularly to the stacking direction of said layers.~~

15. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 14<sub>1</sub>, wherein the quantum well layer comprises an energy band with energy levels of differing energy, and wherein the energy values of the energy levels are so adjusted that ~~[[the]]~~ absorption or emission of photons occurs with a given wavelength.

16. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 14<sub>1</sub>, wherein said nanostructures are self-organized three-dimensional structures.

17. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 16<sub>1</sub>, wherein said self-organized three-dimensional structures are made from a material which has a greater lattice constant than the material of the barrier layer.

18. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 16 wherein said self-organized three-dimensional nanostructures are in the form of quantum dots.

19. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 16<sub>1</sub>, wherein said self-organized three-dimensional nanostructures are in the form of quantum wires.

20. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 14<sub>1</sub>, wherein at least one of the barrier layers is in the form of an aluminum arsenide layer having indium arsenide islands as nanostructures.

21. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 14, wherein at least one of the barrier layers is in the form of an indium phosphide layer having indium arsenide islands as nanostructures.

22. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 14 comprising at least two quantum well layers separated from each other at least by a respective barrier layer.

23. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 14, wherein the nanostructures are of a dimension of less than 50 nm in at least one lateral direction in which they extend.

24. (Currently Amended) ~~[[A]] The quantum well structure as set forth in~~ of claim 23, wherein said dimension is in the range of between 5 and 15 nm.

25. (Previously Presented) A quantum well photodetector comprising at least one quantum well structure as set forth in claim 14.

26. (Currently Amended) A quantum cascade laser comprising at least one quantum well structure ~~as set forth in claim 14~~ comprising cascades of quantum well layers stacked in a stacking direction between barrier layers, said quantum well layers comprising two subbands having two energy levels, wherein at least one of said barrier

layers comprises nanostructures, and comprising intersubband transition regions between said cascades.

27. (Currently Amended) A quantum well structure ~~for the absorption or emission of photons~~ comprising quantum well layers ~~[[have]]~~ having different energy subband values;

said quantum wells containing means for ~~absorbing or emitting photons from an electron undergoing an intersubband transition~~ in said quantum well layers;

~~means for cancelling or modulating homogeneity of electron density distribution in said quantum well layers without substantially influencing said energy values of the quantum well layers;~~

wherein said quantum well layers are stacked in a stacking direction between barrier layers, and

wherein said barrier layers comprise nanostructures configured to cancel or modulate the homogeneity of electron state density distribution extending in at least one direction perpendicular to the stacking direction of said quantum well layers in the absence of said nanostructures.

28. (Withdrawn-Currently Amended) A method of forming an improved quantum well structure, ~~comprising providing a plurality of quantum well layers separated by barrier layers stacked in a stacking direction wherein the improvement comprises:~~

~~configuring said quantum well structure such that electrons undergo intersubband transitions and emit or absorb photons in said quantum well layers~~

wherein electrons tunnel through barrier layers and go from an energy level at a high energy value to an energy level at a low energy value in a first quantum well layer and emit a photon in said first quantum well layer or electrons originate from an energy level at low energy value in a second quantum well layer to absorb a photon in said second quantum well layer; and

providing means for cancelling or modulating homogeneity of electron density distribution in said quantum well layers, wherein said means comprises nanostructures configured to cancel or modulate the homogeneity of electron density distribution extending in at least one direction perpendicular to the stacking direction of said quantum well layers in the absence of said nanostructures, wherein said nanostructures do not substantially influence the energy values of said quantum well layers

comprising the steps of stacking quantum well layers in a stacking direction between barrier layers, wherein at least one of said barrier layers comprising nanostructures, and configuring the electronic structure of said structure such that said quantum well layers comprise two subbands having two energy levels.

29. (Withdrawn-Currently Amended) A method for absorbing or emitting photons from intersubband transitions in a quantum well structure comprising~~g~~[[.]] the steps of

providing a plurality of quantum well layers comprising two subbands having two energy levels, said quantum well layers being separated by barrier layers stacked in a stacking direction;

configuring said quantum well structure such that electrons undergo intersubband transitions and emit or absorb photons in said quantum well layers;

~~wherein electrons tunnel through barrier layers and go from an energy level at a high energy value to an energy level at a low energy value in a first quantum well layer and emit a photon in said first quantum well layer or electrons originate from an energy level at low energy value in a second quantum well layer to absorb a photon in said second quantum well layer; and~~

providing a means for cancelling or modulating homogeneity of electron state density distribution in said quantum well layers, ~~wherein said means comprises~~ comprising incorporating nanostructures into at least one of said barrier layers, said nanostructures being configured to cancel or modulate the homogeneity of electron state density distribution extending in at least one direction perpendicular to the stacking direction of said quantum well layers in the absence of said nanostructures, ~~wherein;~~ and

configuring the electronic structure of said quantum well structure such that said nanostructures have a ground state higher than the energy values of subbands involved in transitions from one energy level to another energy level in adjacent quantum well layers such that said electrons do not tunnel into said nanostructures do not ~~substantially influence the energy values of said quantum well layers.~~

30. (Withdrawn-Currently Amended) A method for permitting an electron to absorb or emit a photon in a quantum well layer of a quantum well structure comprising the steps of

providing quantum well layers having different energy values separated by barrier layers stacked in a stacking direction wherein said electron undergoes intersubband transitions in said quantum well layers, and

providing a means for cancelling or modulating homogeneity of electron state density distribution in said quantum well layers, wherein said means comprises nanostructures configured to cancel or modulate the homogeneity of electron state density distribution extending in at least one direction perpendicular to the stacking direction of said quantum well layers in the absence of said nanostructures, wherein said nanostructures have a ground state higher than the energy values of subbands involved in transitions from one energy level to another energy level in adjacent quantum well layers such that said electrons do not tunnel into said nanostructures do not substantially influence the energy values of said quantum well layers, and

wherein electrons tunnel through barrier layers and go from an energy level at a high energy value to an energy level at a low energy value in a first quantum well layer and emit a photon in said first quantum well layer or electrons originate from an energy level at low energy value in a second quantum well layer to absorb a photon in said second quantum well layer.

31. (New) A quantum well structure comprising quantum well layers stacked in a stacking direction between barrier layers, wherein at least one of said barrier layers comprises nanostructures, and said nanostructures have a ground state higher than the energy values of subbands involved in transitions from one energy level to another energy level in adjacent quantum well layers in the stacking direction.

32. (New) A quantum well structure comprising a power supply, quantum well layers stacked in a stacking direction between barrier layers, at least one of said barrier layers comprising nanostructures, wherein said power supply is configured to prevent carriers from tunneling from said quantum wells into said nanostructures.